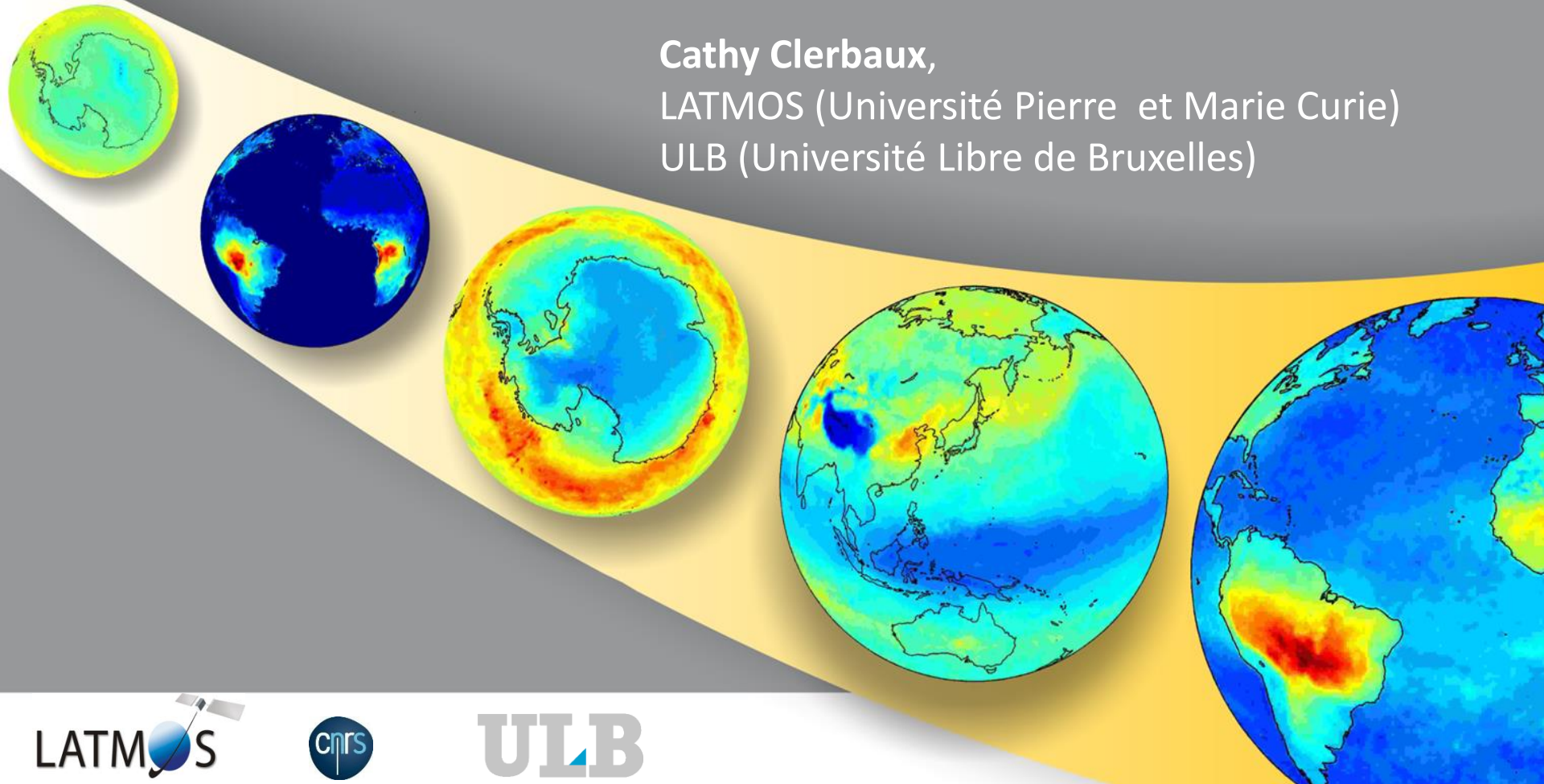


New ozone results for IASI

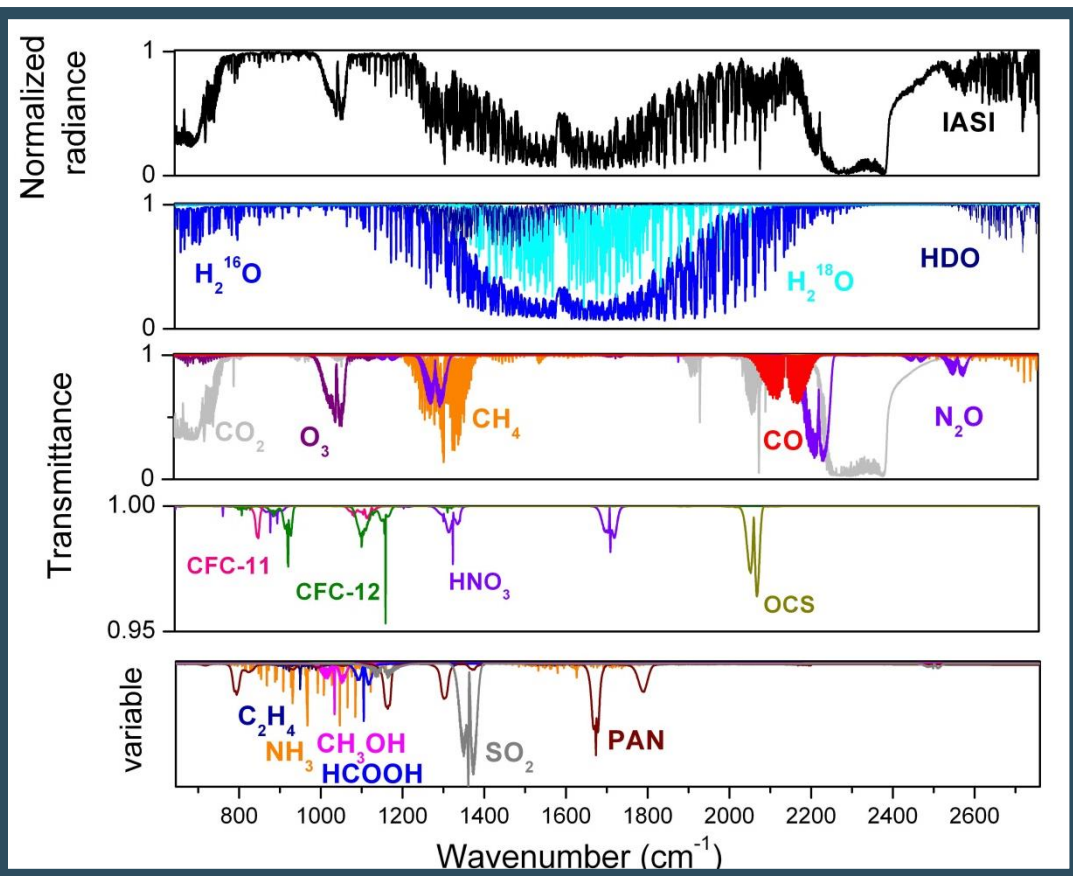
Cathy Clerbaux,
LATMOS (Université Pierre et Marie Curie)
ULB (Université Libre de Bruxelles)





8431 channels /spectra
~15 GB data/day
~1,3 million spectra/day

IASI measurement capabilities



1a/ Meteorology

Weather forecast

1b/ Atmospheric composition

Climate gases monitoring

Understand atmospheric chemistry

bonus

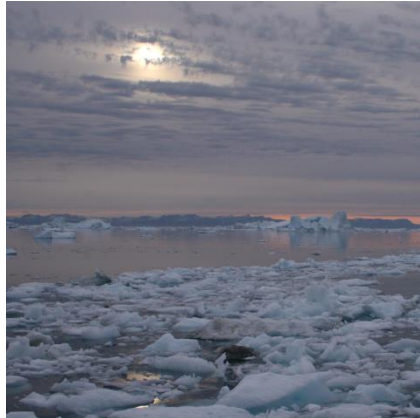
Operational applications

*Fires detection, volcanic plumes
T + 2.5 heures*

List of species that were measured/detected by IASI:

H₂O CO₂ N₂O O₃ CO HNO₃ HDO NH₃ PAN HONO C₄H₄O CH₄ C₂H₂ C₂H₄ C₃H₆ CH₃OH HCOOH
CH₃COOH CH₃CHO CFC-11 CFC-12 HCN OCS SO₂ H₂S + aerosols

What can we see with IASI?



Ozone North Pole



Fires in Moscou



Asian monsoon



Eyjafjöll volcano



Ozone pics in summer



Sand storm Sydney

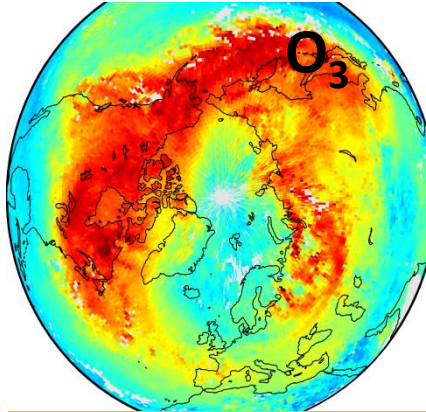


Industrial hotspots

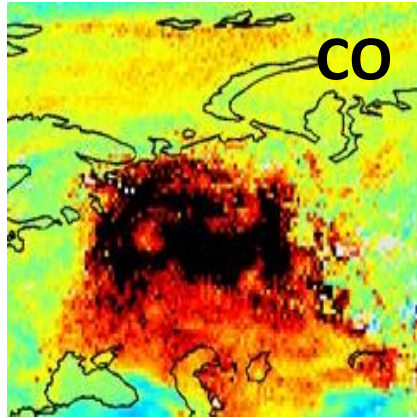


Pollution in Beijing

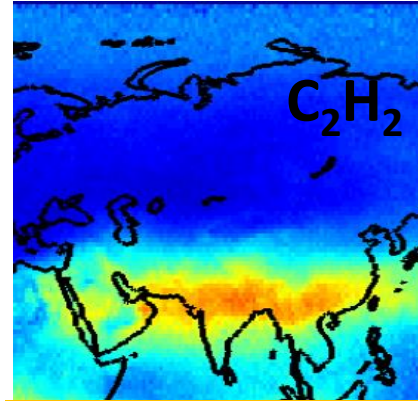
What can we see with IASI?



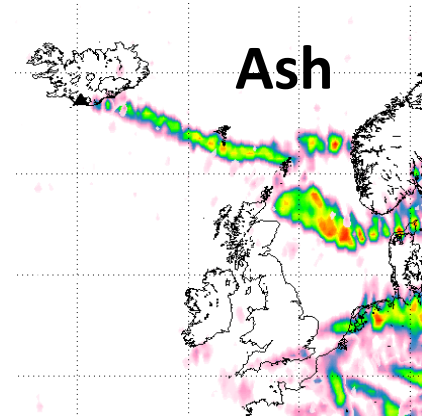
Ozone North Pole



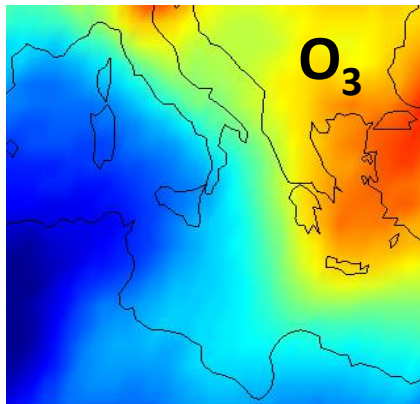
Fire in Moscou



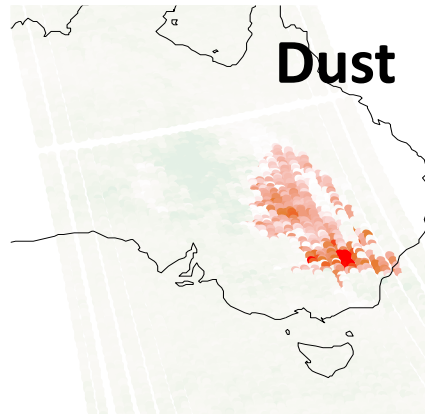
Asian monsoon



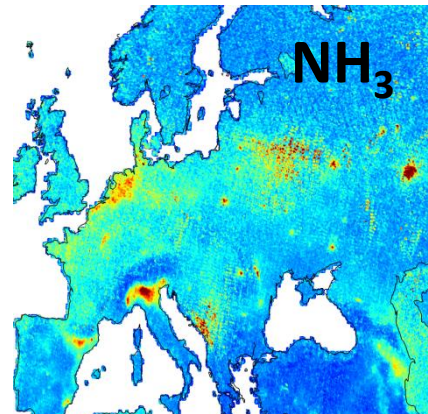
Eyjafjöll volcano



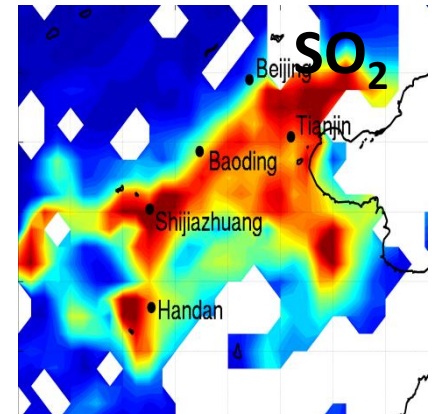
Ozone pics in summer



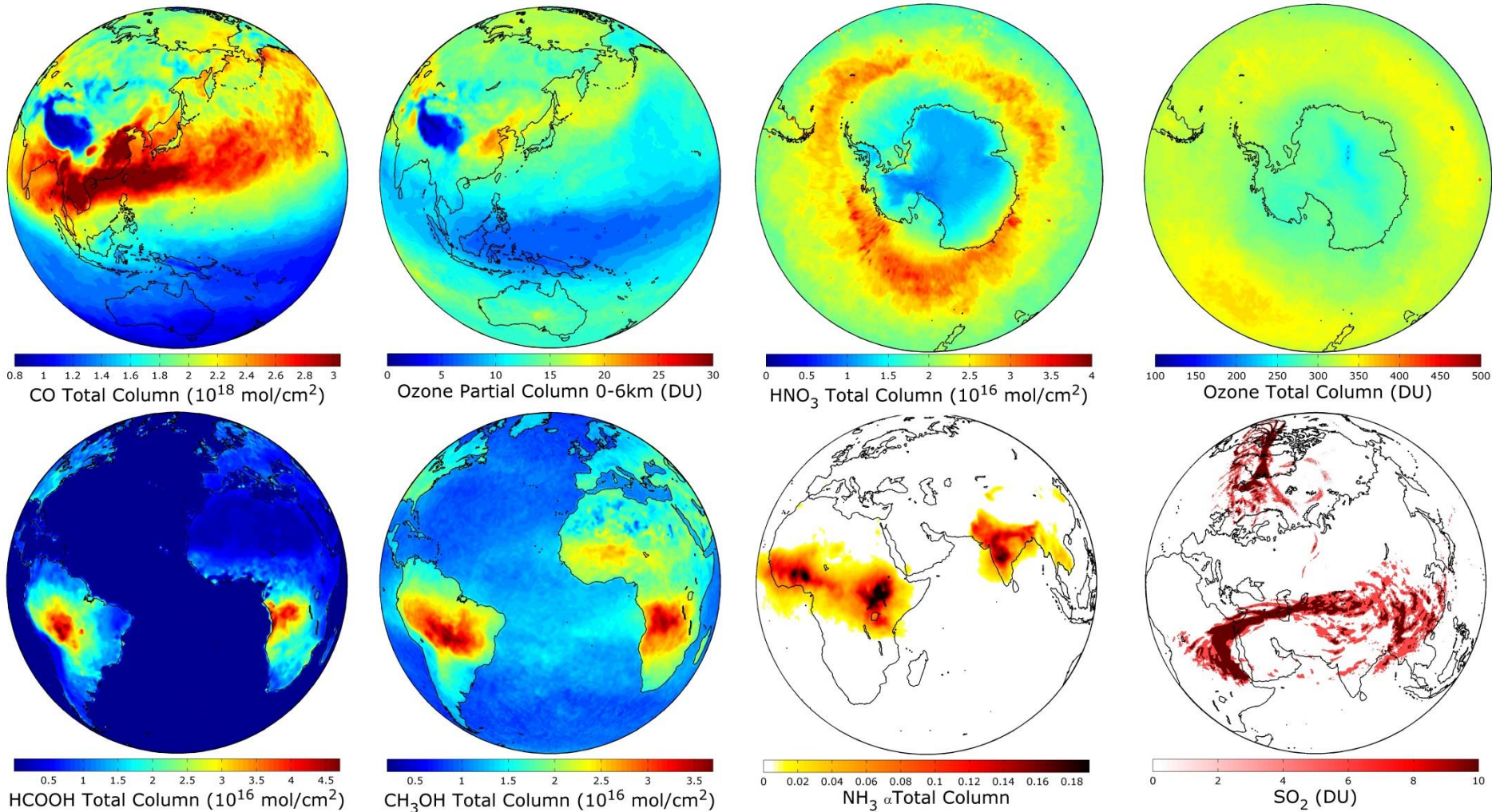
Sand storm Sydney



Industrial hotspots



Pollution in Beijing



CO, ozone, SO₂ and HNO₃ operationally processed



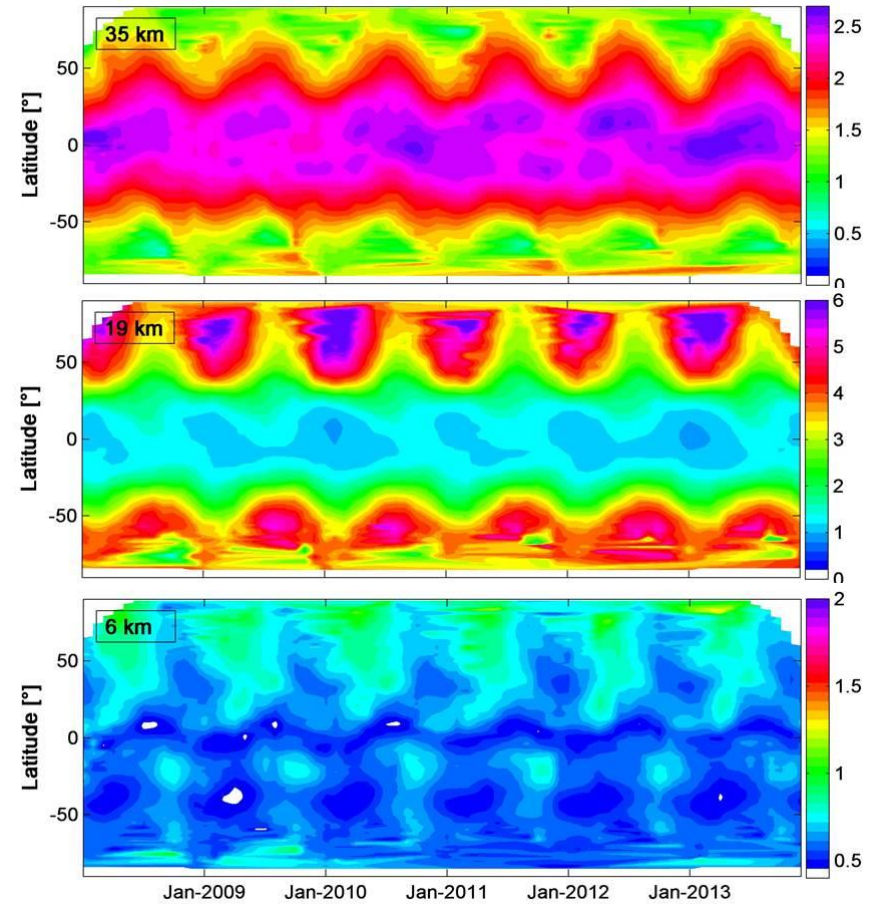
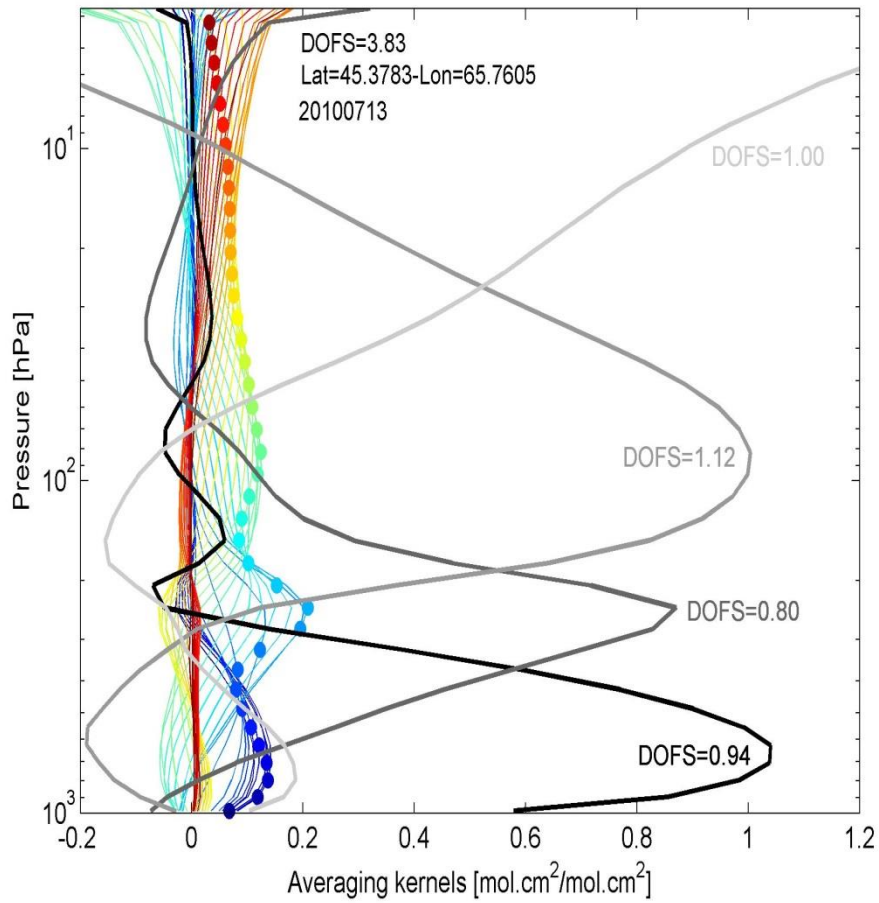
Ozone

Tropospheric chemistry
Intercontinental transport
Air quality

Users:
Scientific community
MACC community
O3-CCI

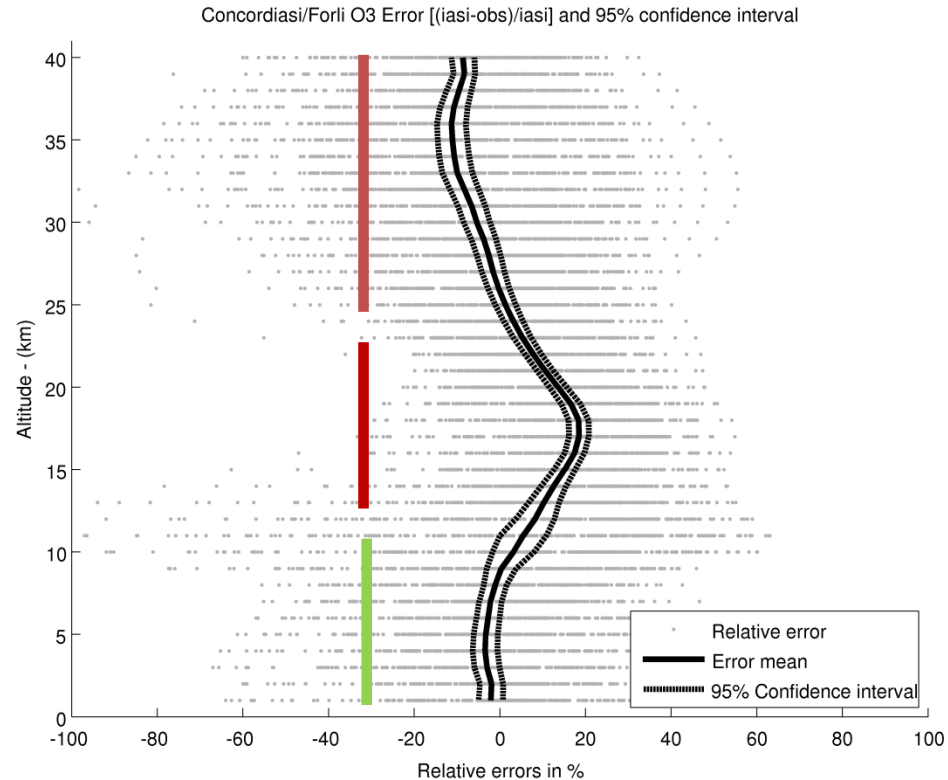
Chemistry-climate
Ozone hole

Ozone



IASI-O3 profiles versus Concordiasi balloon

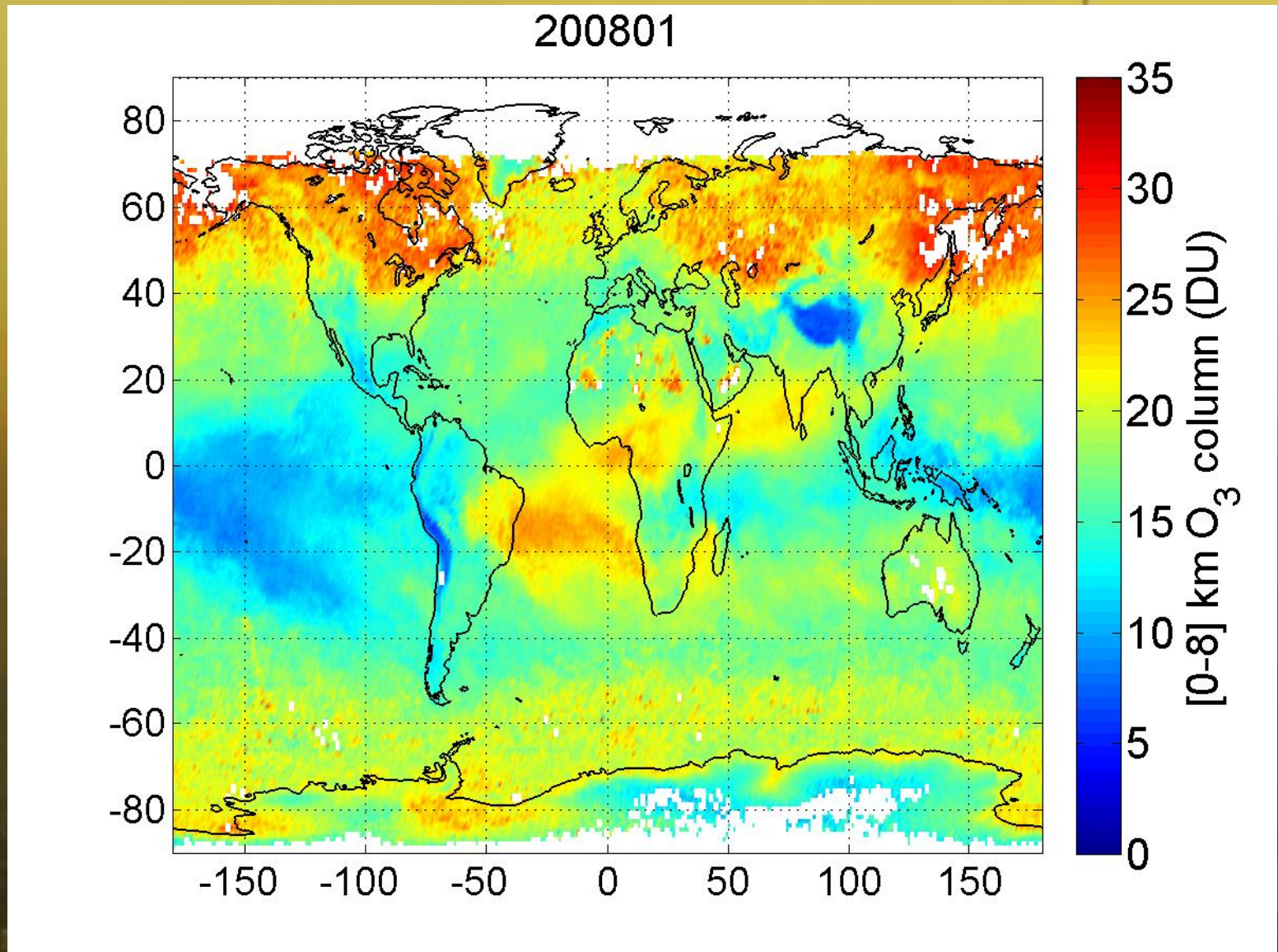
Antarctic ozone, profiles



O₃ [0-10 km]: good agreement;
UT/LS : positive biais (+15%@15-20 km);
Above 30 km : small negative biais

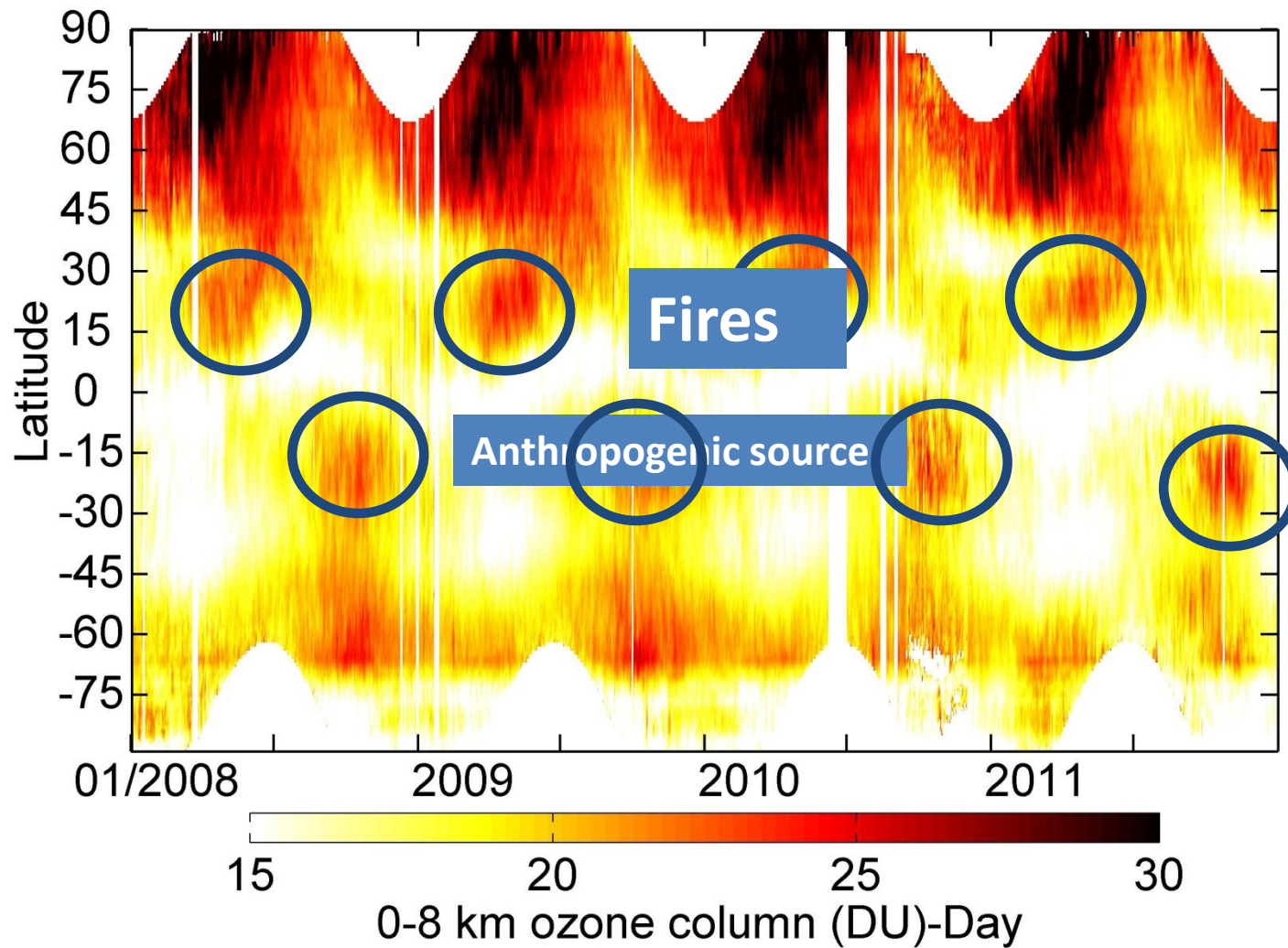
Gazeaux, J., Clerbaux, C., George, M., Hadji-Lazaro, J., Kuttippurath, J., Coheur, P.-F., Hurtmans, D., Deshler, T., Kovilakam, M., Campbell, P., Guidard, V., Rabier, F., and Thépaut, J.-N.: Intercomparison of polar ozone profiles by IASI/MetOp sounder with 2010 Concordiasi ozonesonde observations, *Atmos. Meas. Tech.*, 6, 613-620, doi:10.5194/amt-6-613-2013, 2013.

Seasonal variation of tropospheric O₃ over the period 2008-2013

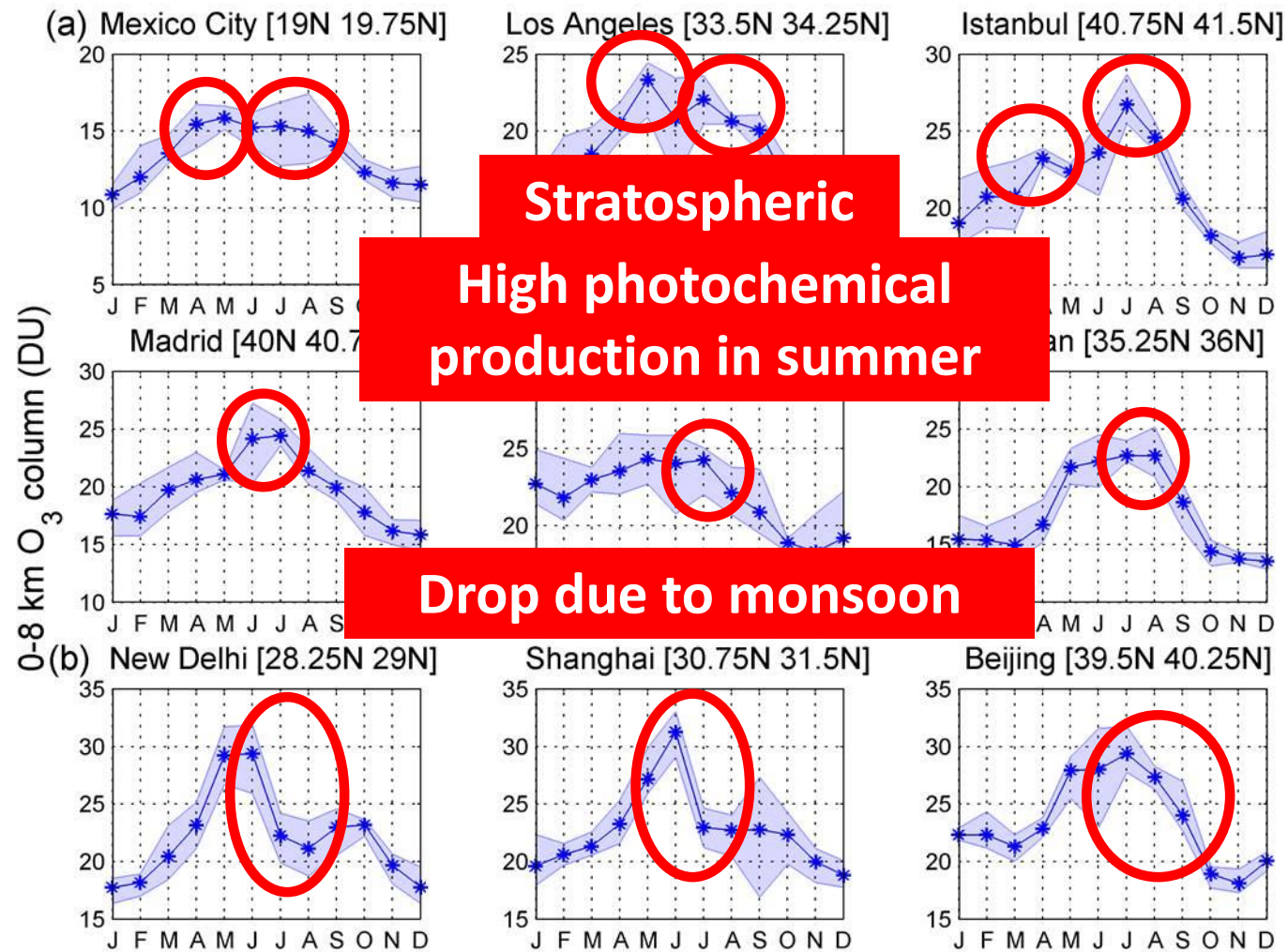


Courtesy S. Safieddine (LATMOS)

ZONAL PLOT 2008-2011



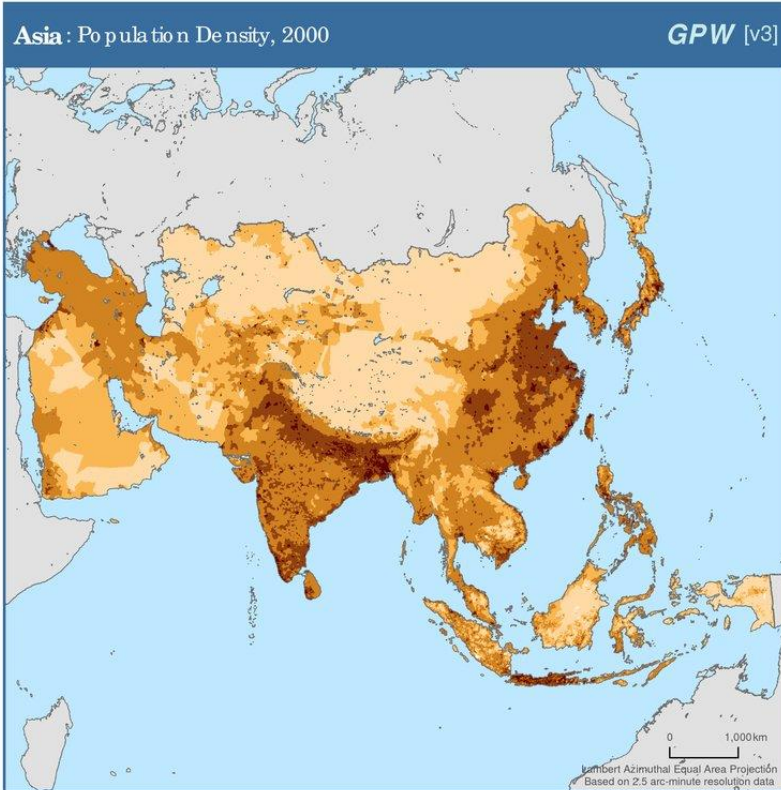
Seasonal Cycling of Ozone in Urban Regions



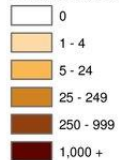
China



Anthropogenic sources?



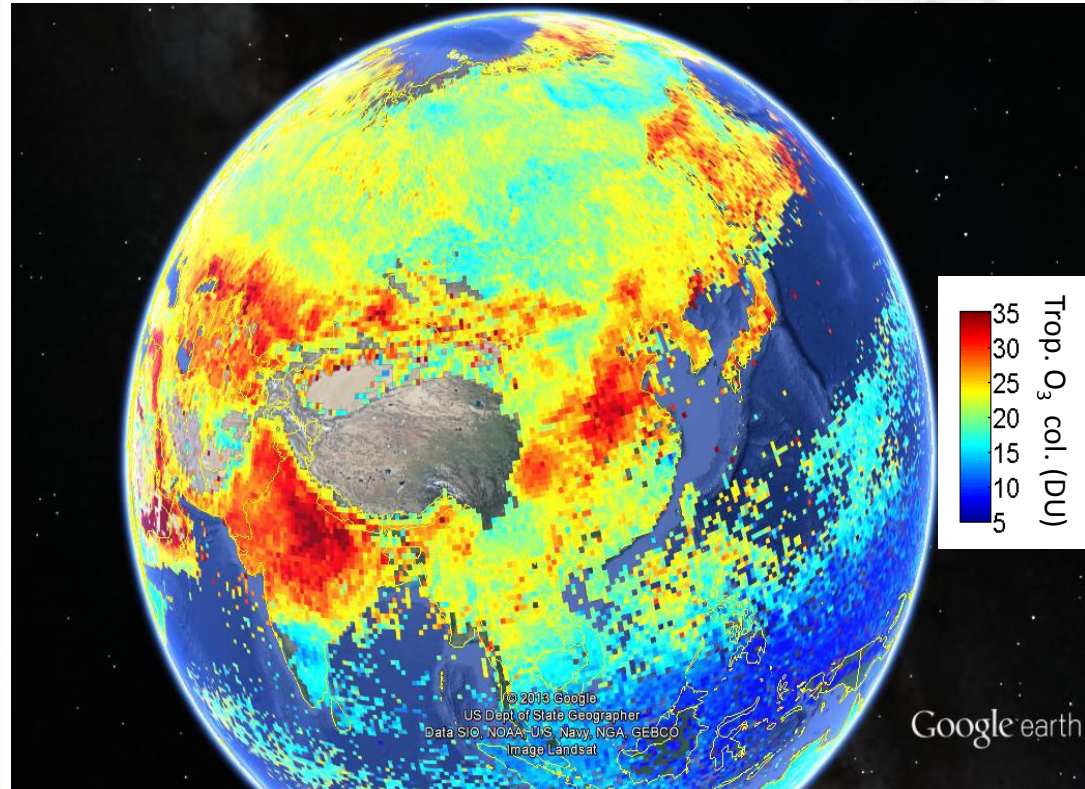
Gridded Population of the World
Persons per km²



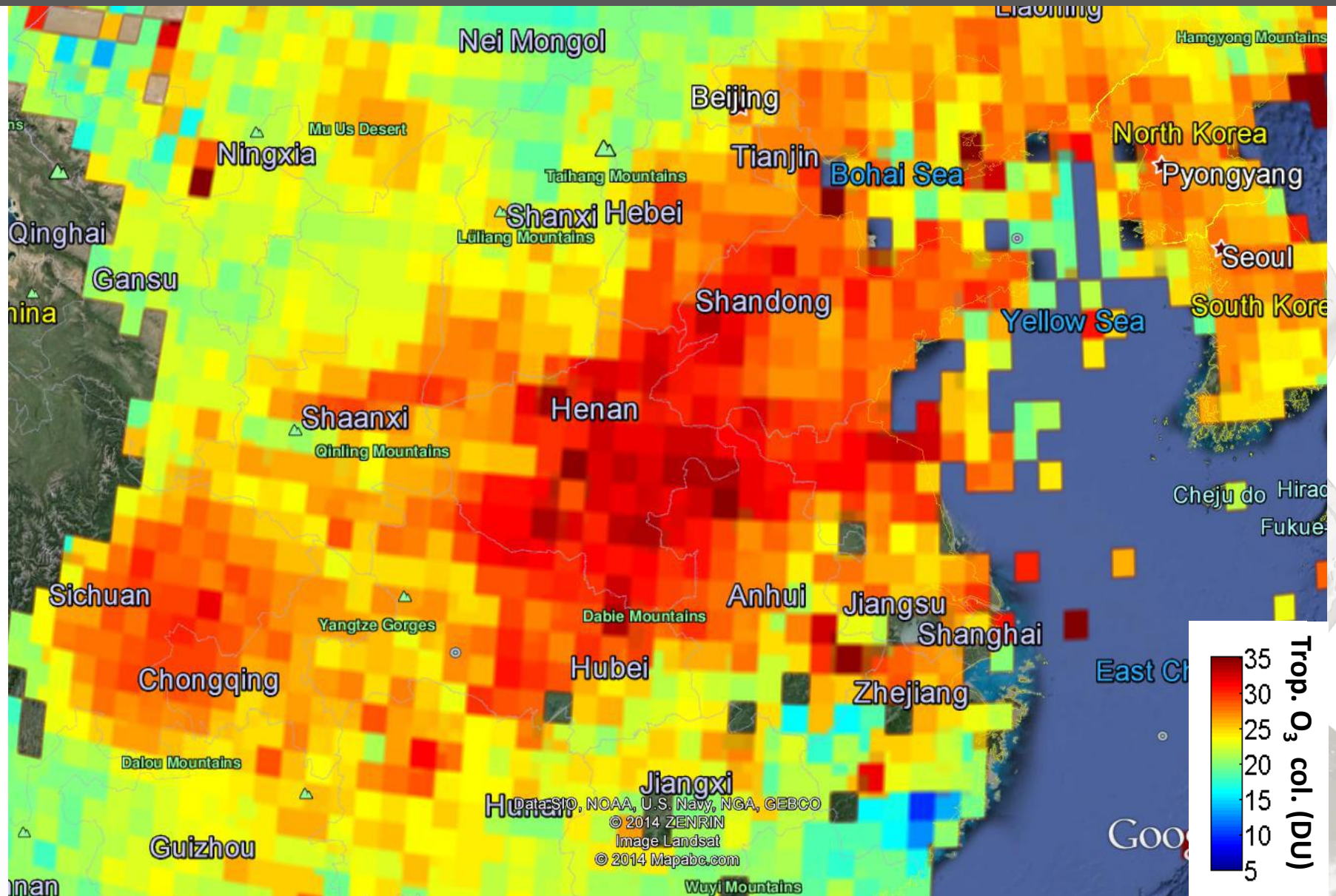
Copyright 2005, The Trustees of Columbia University in the City of New York.
Source: Center for International Earth Science Information Network (CIESIN), Columbia University; and Centro Internacional de Agricultura Tropical (CIAT).
Gridded Population of the World (GPW), Version 3, Palisades, NY: CIESIN, Columbia University. Available at <http://sedac.ciesin.columbia.edu/gpw>.

NOTE: National boundaries are derived from the population grids and thus

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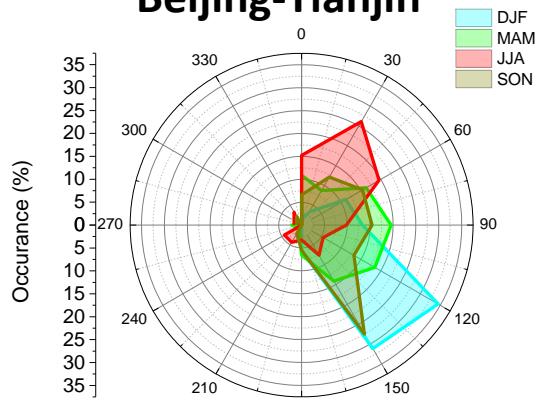


Trop. O₃ column over China as seen by IASI

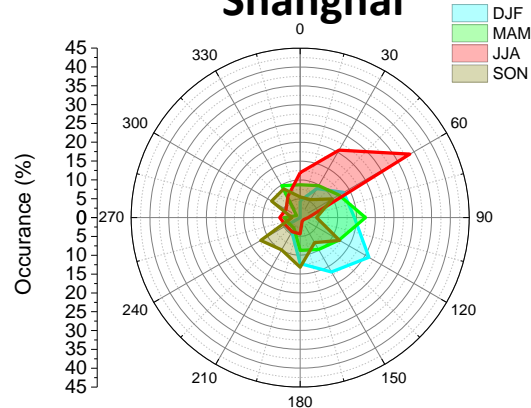


Summer monsoon

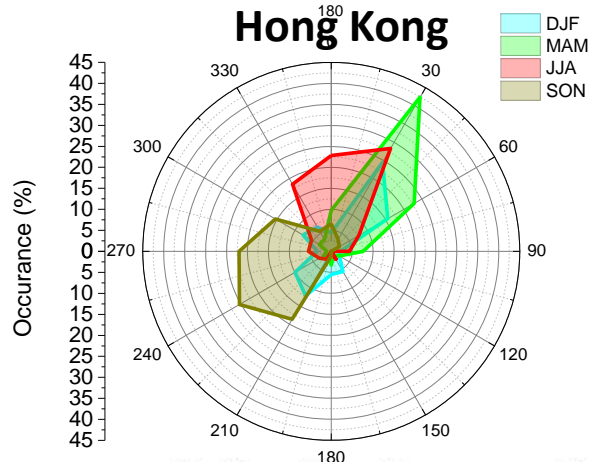
Beijing-Tianjin



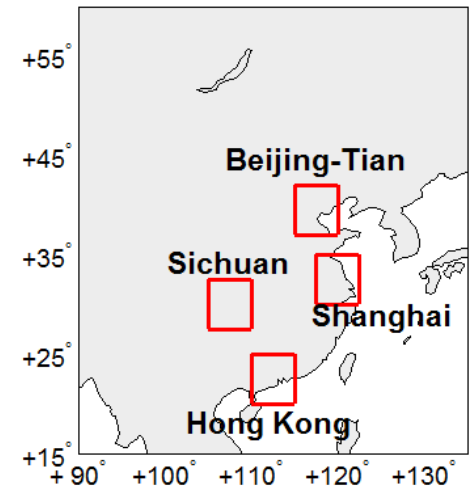
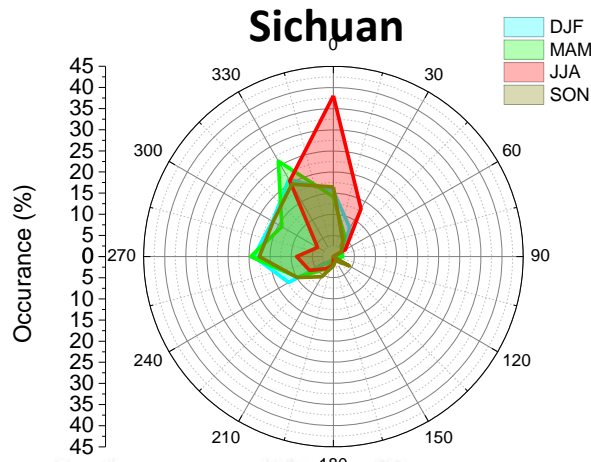
Shanghai



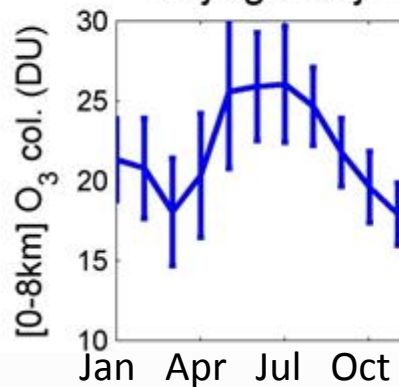
Hong Kong



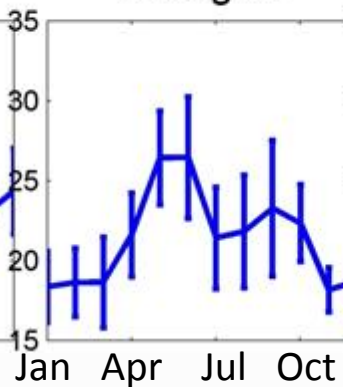
Sichuan



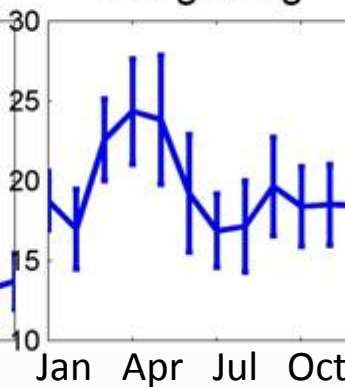
Beijing/Tianjin



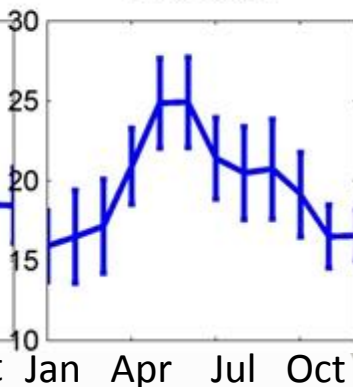
Shanghai



Hong Kong



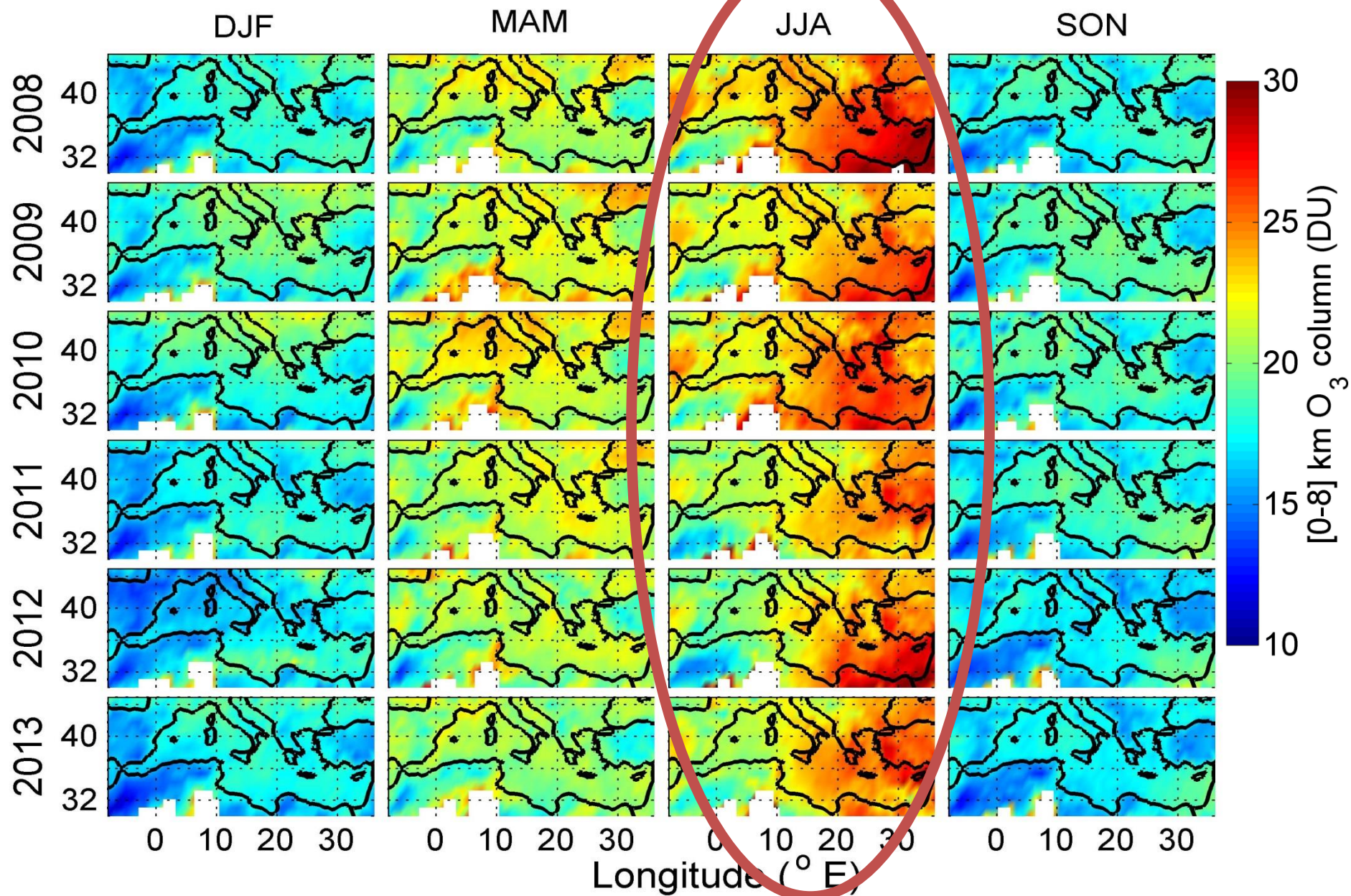
Sichuan



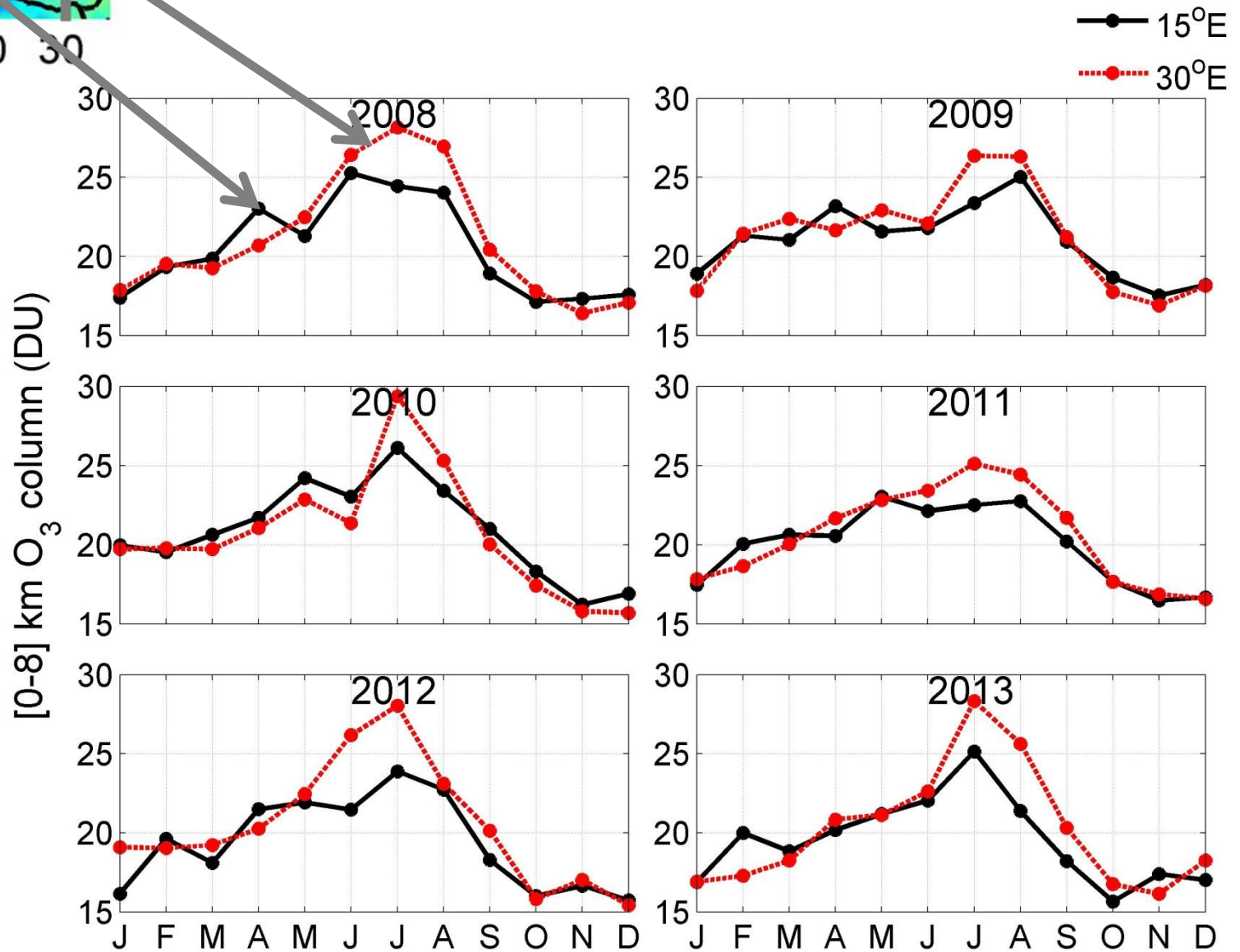
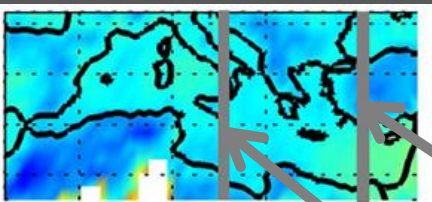
Mediterranee



Seasonal variation as seen by IASI



Seasonal variation as seen by IASI



WRF-Chem model (Weather Research and Forecasting Model with Chemistry)

¹[Klimont et al., in prep]

² [Wiedinmyer et al., 2006, 2010]

³ [Emmons et al., 2010]

Emissions

Anthropogenic: EU ECLIPSE¹
Biogenic: MEGAN
Wildfire: Fire inventory from NCAR²

Meteorological boundary conditions

NCEP/GFS

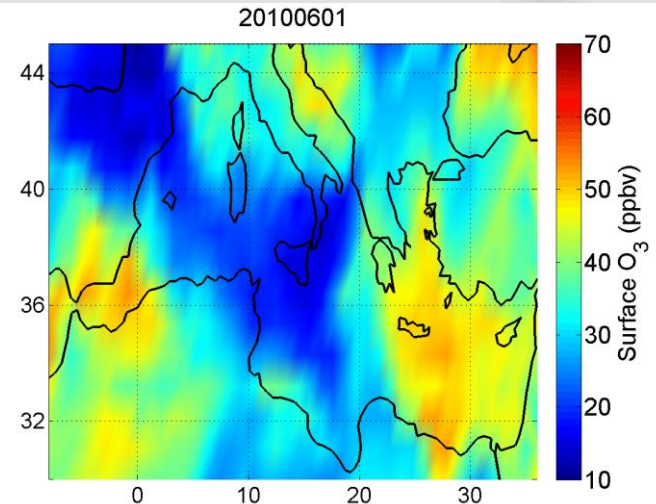
Chemical boundary conditions

MOZART-4³

Model Evaluation

Surface observations
Satellite data

Regional CTM WRF-Chem



Period simulation

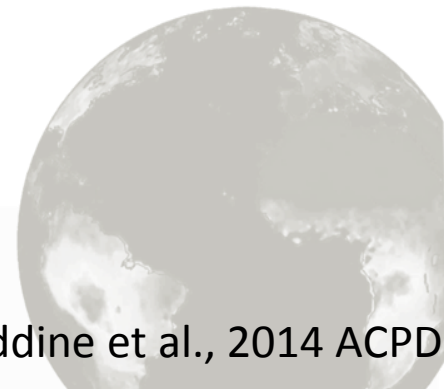
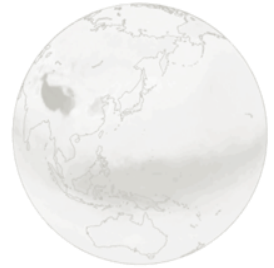
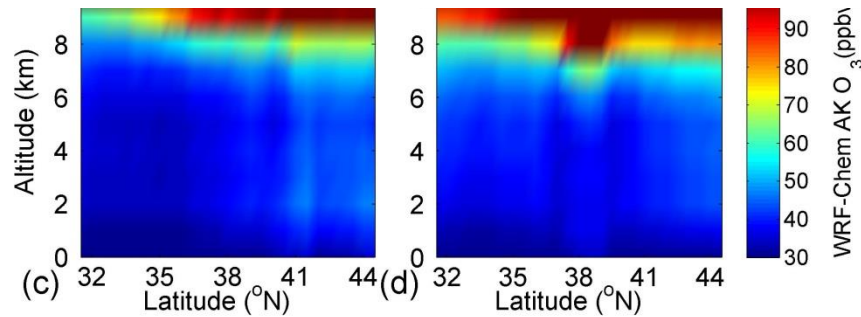
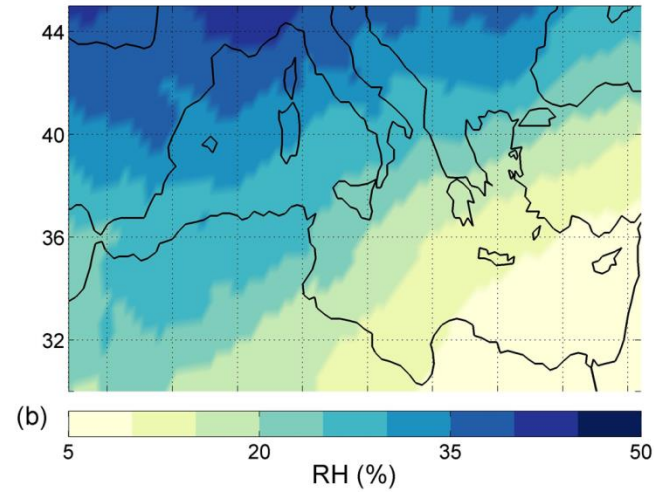
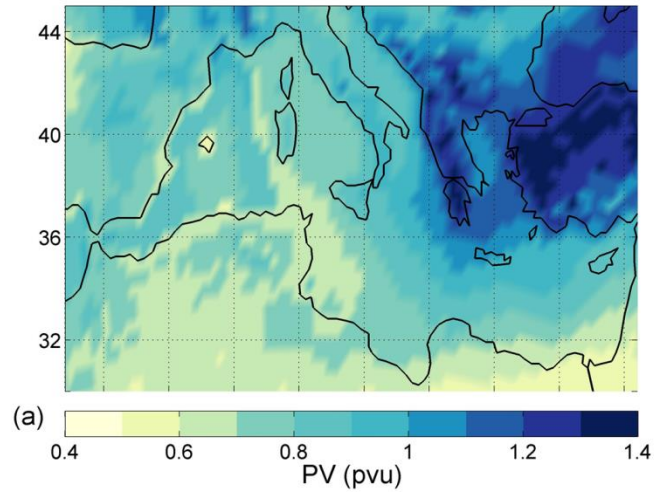
20 May – 31 August 2010

Horizontal resolution

50 km x 50 km

IASI and WRF-Chem detection of STE events

JJA 2010



Ozone with IASI

Six years of data (total columns and profiles) now available,.

- Good sensitivity in the middle troposphere
- Low sensitivity towards the surface
- Known bias in the UTLS

Operationnally retrieved at LATMOS/ULB, to be transferred at Eumetsat CAF (O3MSAF-CDOP2) whenever possible

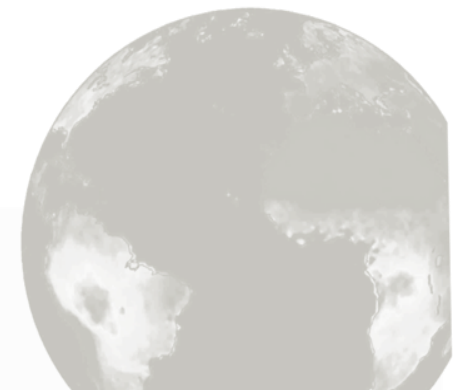
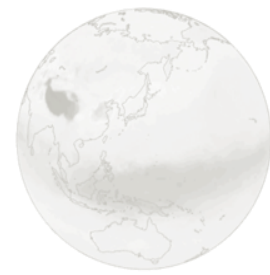
Now included in CCI-O₃ (phase 2)

Continuity (20 years) foreseen with IASI/MetOpC and

IASI-NG (or advanced IASI) on

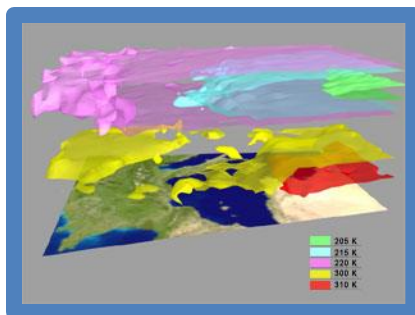
EPS-SG (or Metop-SG) *Eumetsat nomenclature*

Sentinel5 /IR component - *ESA nomenclature (but not all the time)*

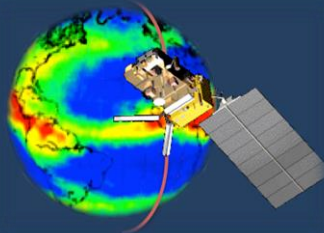


From 2020 and onwards...

**Atmospheric
profiling**

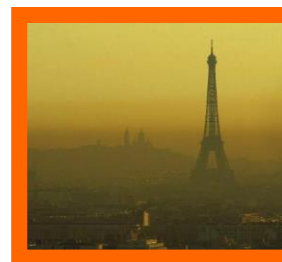


IASI-NG



**Improvement
on pollution
forecast**

3 EU controlled
pollutants (CO,
O₃ and NH₃)



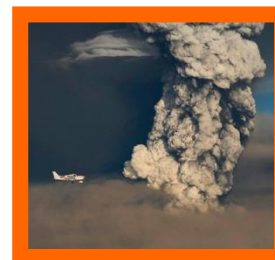
**Better tracking
of long range
pollution (e.g.
fire emissions)**



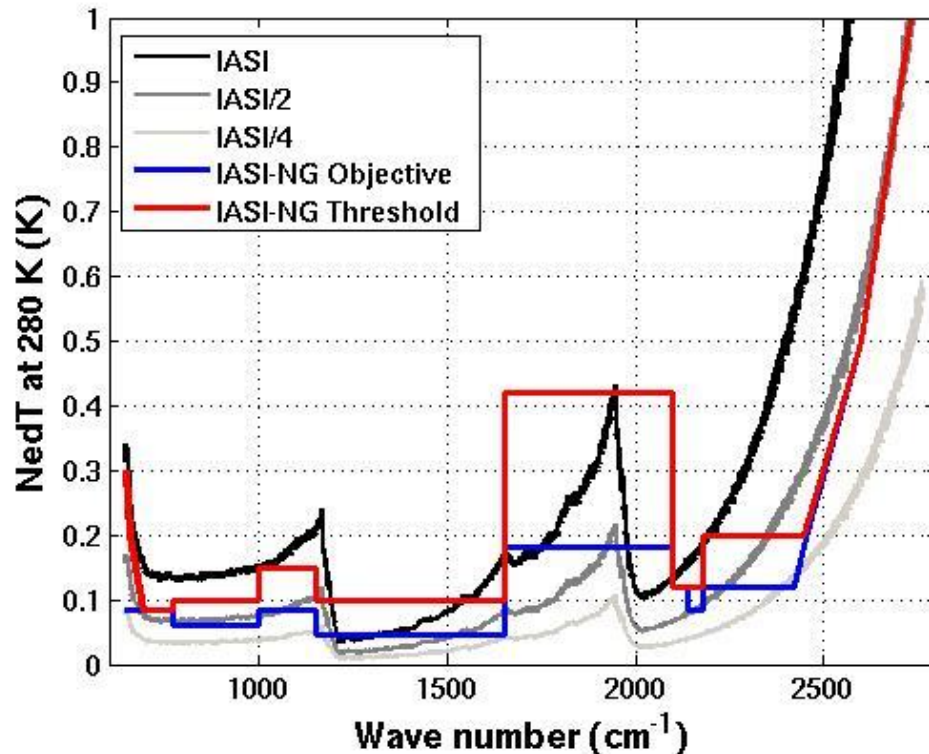
**Essential Climate
Variables
monitoring and
understanding**
Clouds, GHG,
aerosols



**Improved
volcanoe alerts**
Early alerts
possible + SO₂
and ash tracking

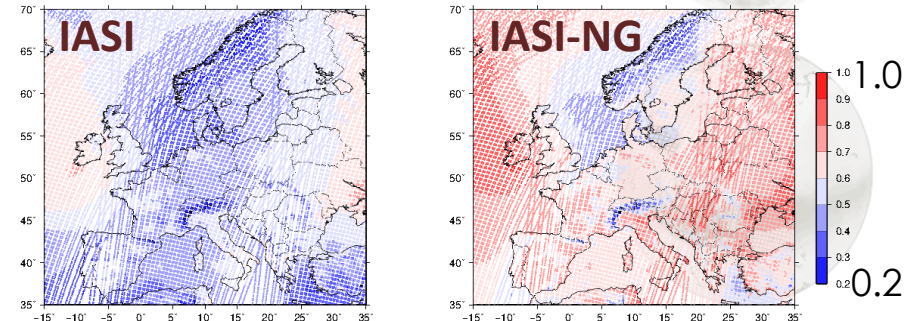


IASI-NG: impact on atmospheric composition

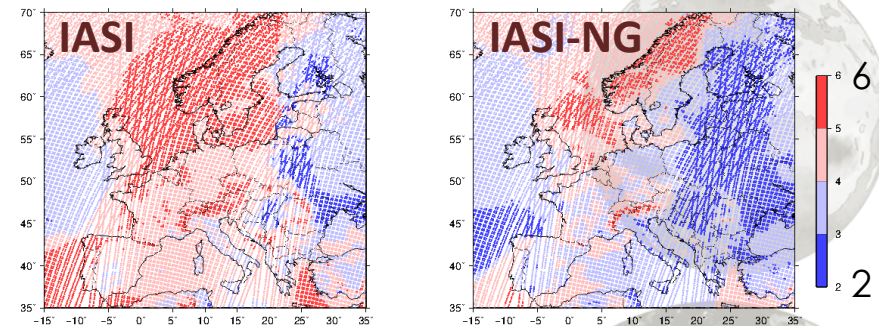


Specifications from CNES 2012 ITT

Ozone DOFS



Altitude of max. sensitivity (km)



Simulation performed using a regional model that described an increase of (0-6km) **ozone** observed in Europe (August 20th, 2009).